**Lab 7：Digital carrier transmission**

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| **Introduction**  In lab7, we have done digital carrier transmission by labview. For the signal which is transferred, the first step is to encode into bit streams and then encapsulate bit streams into packets. After that, packets is input into PSK modulator and then perform symbol mapping and pulse generation. The generated signal is transmitted through the channel with noise. At the receiving end, the received signal is demodulated synchronously by PSK demodulator. The effect recovered can be represented by bitstreams, constellations, and eye maps.    **Lab results & Analysis**：  The following pictures are the program chart.    ***M-PSK Simulation***    ***Image Transmission***  **Analysis:**  For 2PSK, the error code exists obviously and the eye diagram is turbid when the value of SNR is less than 8(8 is estimated value). However, the error code almost disappears when the value of SNR is equal to or greater than 8. The eye diagram become more and more clear with the value of SNR increasing.    ***2PSK, SNR=7***    ***2PSK, SNR=340***  For 4PSK, the error code exists obviously and the eye diagram is turbid when the value of SNR is less than 11(11 is estimated value). The error code almost disappears when the value of SNR is equal to or greater than 11. The eye diagram become more and more clear with the value of SNR increasing.    ***4PSK, SN444R=8.5***    ***4PSK, SNR=22.7***  Through the above analysis, we will draw the picture about the relationship between the bit error rate of MPSK and signal-to-noise ratio using matlab.  The code is below.  % M 进制 PSK 调制参数设置  N = 1000000; % 仿真点数  B = 2; % PSK 进制数  A2 = B - 1; % PSK 调制数据的最大幅值  data2 = randi([0, A2], N, 1); %产生随机信号  Q = 4; % PSK 进制数  A4 = Q - 1; % PSK 调制数据的最大幅值  data4 = randi([0, A4], N, 1); %产生随机信号  E = 8; % PSK 进制数  A8 = E - 1; % PSK 调制数据的最大幅值  data8 = randi([0, A8], N, 1); %产生随机信号  S = 16; % PSK 进制数  A16 = S - 1; % PSK 调制数据的最大幅值  data16 = randi([0, A16], N, 1); %产生随机信号  % 信噪比变化范围  SNR = 0:1:50;  % M 进制 PSK 调制  modData2 = pskmod(data2, B);  modData4 = pskmod(data4, Q);  modData8 = pskmod(data8, E);  modData16 = pskmod(data16, S);  % 在不同信噪比下进行仿真  for i = 1:length(SNR)  % AWGN信道，'measured'代表加入噪声前测量信号能量  rxSig2 = awgn(modData2, SNR(i), 'measured');  % M 进制 PSK 解调  rxData2 = pskdemod(rxSig2, B);  % 统计误码比特数以及误码率  [err\_bit2(i), err\_rate2(i)] = biterr(data2, rxData2);    % AWGN信道，'measured'代表加入噪声前测量信号能量  rxSig4 = awgn(modData4, SNR(i), 'measured');  % M 进制 PSK 解调  rxData4 = pskdemod(rxSig4, Q);  % 统计误码比特数以及误码率  [err\_bit4(i), err\_rate4(i)] = biterr(data4, rxData4);    % AWGN信道，'measured'代表加入噪声前测量信号能量  rxSig8 = awgn(modData8, SNR(i), 'measured');  % M 进制 PSK 解调  rxData8 = pskdemod(rxSig8, E);  % 统计误码比特数以及误码率  [err\_bit8(i), err\_rate8(i)] = biterr(data8, rxData8);    % AWGN信道，'measured'代表加入噪声前测量信号能量  rxSig16 = awgn(modData16, SNR(i), 'measured');  % M 进制 PSK 解调  rxData16 = pskdemod(rxSig16, S);  % 统计误码比特数以及误码率  [err\_bit16(i), err\_rate16(i)] = biterr(data16, rxData16);  end  % 绘制误比特率与信噪比曲线，纵轴为对数尺度  plot(SNR ,err\_rate2);hold on;  plot(SNR,err\_rate4);hold on;  plot(SNR ,err\_rate8);hold on;  plot(SNR ,err\_rate16);hold on;  legend('2PSK','4PSK','8PSK','16PSK');grid on;  title('M-PSK 在 AWGN 信道下误比特率分析');  xlabel('Eb/N0');ylabel('BER');  The picture is below.    From the picture, what can be know is that the bit error rate of M-PSK decreases with the value of SNR increasing. What’s more, the bit error rate of 2PSK is 0 when the value of SNR is 7. The bit error rate of 4PSK is 0 when the value of SNR is 10. The bit error rate of 8PSK is 0 when the value of SNR is 17. the bit error rate of 16PSK is 0 when the value of SNR is 21. The above results are in good agreement with the above experiments. | |
| **Experience**  The first thing I have learned is how to simulate digital carrier transmission system by using labview. Besides, what’s the most important thing is how to draw the picture about the relationship between the bit error rate and the value of SNR and the comparation of MPSK. | |
| **Score** | 100 |